Arms Control and European Unity: Some Prospects for the Next Ten Years

Karl W. Deutsch

To understand the problems of arms control and disarmament, and to act on them, requires a sense of morality, a knowledge of specialized technical problems, and an understanding of political realities. The United States is fairly well supplied with moralists and specialists. What we need most to know now about arms control and disarmament is what can be done about it at particular times and places; which governments and peoples will be our partners, now and during the years ahead; what, at each time, will be their interests; how, at each time, these interests are likely to be related to the interests of the United States; and what changes in some of these matters are to be expected over the next ten years.

The Background of the Study

Social scientists at universities are moved to the study of such questions by many motives, from their curiosity as scholars to their responsibility as citizens. Both private and public agencies have become increasingly willing to support such freely conducted and freely published scholarly research. Such research deliberately excludes all secret data. Its results are the exclusive responsibility of the scholars who conducted the studies while remaining free in their judgments and opinions and in their reading of whatever evidence they found. The data and findings of such studies are available to public officials, as well as to legislators and to private citizens, for the making of their own decisions on arms control, disarmament and foreign policy that lies ahead.

The forthcoming book, *Arms Control and the Atlantic Alliance,* is based on such a study. It was undertaken in 1963-1965 at Yale University and in Western Europe, under the research direction of the author and the administrative direction of Richard L. Merritt, both at Yale. It included research work by eight other university faculty members at Yale and other universities—including Professors Roy C. Macridis at Brandeis and Lewis J. Edinger at Washington University,

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Comment

The current year promises to be one of decision for the U.S. Copyright Law. Legislation to revise the Law (which has not been changed since 1909) has been pending before Congress for two years. Prior to that, it was under study for a period of eight years by a panel of leading copyright attorneys meeting under the direction of the Register of Copyrights. This thorough and comprehensive study by the Copyright Office and the Congress will provide a solid basis for legislative decision during 1967.

The copyright bill now approved by the House Judiciary Committee is particularly effective in defining the limits of photocopy use of copyrighted materials. Long a sensitive issue between authors and educators, photocopying gives every promise of becoming more efficient, more economical, and thus more widely used, in the decades ahead. The House bill now omits proposals which would have given teachers free use of photocopies of copyrighted material in the classroom. Instead, the bill reaffirms the "fair use" doctrine which has been the classic test of the legality of copying. Unlike the previous Law, the present bill provides statutory recognition of "fair use" for the first time. It now remains for the user to demonstrate that he has complied with the doctrine as defined in the bill and the accompanying Committee report. On the other hand, the Committee has been careful to assure that teachers using new photocopying techniques for educational purposes should not be discouraged from so doing.

As a matter of fact, the doctrine of "free use" required considerable skill in judicial interpretation. The language of the proposed legislation lists four considerations: the purpose and character of the use; the nature of the copyrighted work; the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and the effect of the use upon the potential market for or value of the copyrighted work. While the Committee report spells out certain distinctions in some detail, there can be no question that advances in copying techniques will inevitably complicate the issue in the years ahead.

Once the new legislation is in effect, it will be the task of authors, teachers, librarians, and others to seek workable solutions to these problems in a spirit of fairness and good will. Surely the classrooms of America must be encouraged to take advantage of forthcoming advances in technology to the benefit of the nation as a whole. And equally surely, the contributions of authors and scholars must be protected if they are to continue their creative roles in our society.

W. Bradford Wiley

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Letters

Censorship
Re your guest editorial, "A Society's Lack of Confidence in Itself" (Spring, 1966). Although I would agree with you that freedom of the press is indeed threatened by the unfortunate decisions of the Supreme Court, I can hardly concur in your mad rush to defend the publishing industry and particularly Mr. Ginzburg. I find your Glass House most vulnerable.
Frank E. Guthrie
Raleigh, North Carolina

There is hardly a Supreme Court decision nowadays that does not strengthen the right of the individual to the detriment of society as a whole. Can we not tolerate an occasional decision that attacks immorality, crime, bigotry, or any of the other issues that are threatening to engulf us? Must everything decent in our life be sacrificed for these precious Constitutional rights?
John F. Brubaker
Sharon, Pennsylvania

In reprinting Roger Smith's editorial you have brought it to a larger audience and have performed a public service. I am heartened by the fact that a publisher of the integrity of Wiley has lent its voice in protest against an aberration in the history of the Supreme Court.
Maurice Griffel
Philadelphia, Pennsylvania

Freedom of the press is of course a noble theme for it suggests academic freedom and liberty, Thomas Paine and all that... However, in this day of mass media and automated presses, I think it may have a salutary effect on the brethren of the "fast book and the fast buck" to be reminded by the Supreme Court that along with freedom to publish there goes an accompanying responsibility.
John W. Reid
Indiana, Pennsylvania

Whinnery
I enjoyed reading Dr. Whinnery's comments ("Engineering in the Multiversity," Spring, 1966) because I agreed with them. I do take issue, however, with following comment: "Those who choose the university do so, with exceptions, because they like teaching and because for them, the combination of teaching and research is exciting and effective." Teaching and research may be complimentary, but in most cases, it is not (my experience). A conscientious teacher can spend all his time on teaching duties, just as a researcher can spend all his time on research. It is a rare individual who can apportion his time so as to do justice to both teaching and research.
A. Zygmont
Villanova, Pennsylvania

Bruner
I received my first issue of the *World of Wiley* today (Spring, 1966, issue), and am indebted to you for the perceptive and cogent articles. The paper by J. S. Bruner, "On Cognitive Growth," is especially pertinent to the growing problem of communications and the need for confusion-free language.
Harlan H. Roepke
Muncie, Indiana

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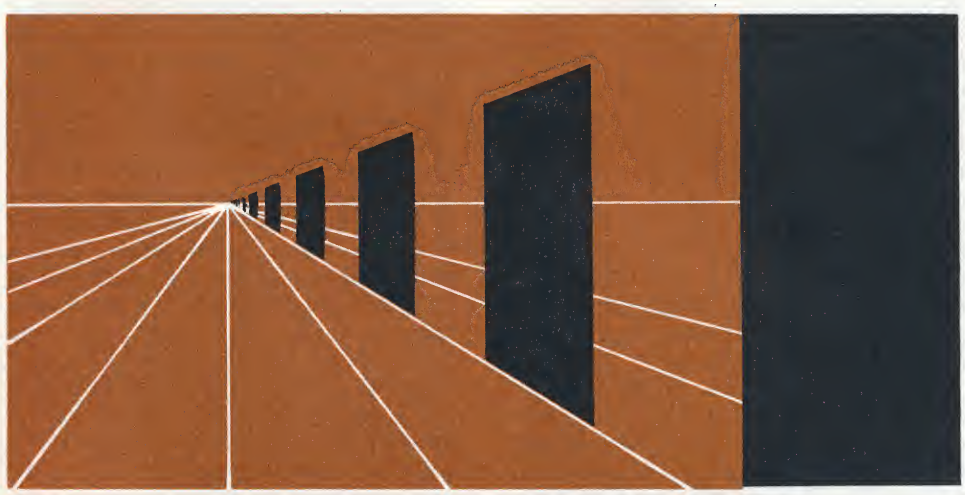
Perspectives in Modern Physics

Robert Oppenheimer

When I was asked to write on Perspectives in Modern Physics in honor of Hans Bethe, I had thought to prepare yet another evaluation, for professional colleagues, of which features of today's landscape might be expected to endure, which seemed destined to change, for what reasons, perhaps even in what way. I came to doubt whether such an appraisal, at this time, and from my hand, would bring much pleasure to the man it was intended to honor. Instead, I have decided to dedicate to him, for his sixtieth birthday, a brief account for the general intellectual community of the role of physics in this century. The first and longer part concerns the theory of relativity and quantum theory, to whose scope and power Bethe in his professional life has brought such great enlargement. The second part deals briefly with an aspect of the applications of physics which has, over the last two decades, been of profound concern to Bethe.

These remarks were made on the occasion of James Smithson's two hundredth birthday, in the city of Washington, which, both for Bethe and for me, in rather different ways, has been a city both of sorrow and of hope.



Physics has played a part in the history of the last five centuries. Closely related to astronomy, to mathematics and to philosophy in its earlier years, it now has intimate relations also with all branches of science, and plays an increasingly explicit, conscious and visible role in the changing conditions of man's life. But it does not have the kind of unity which Smithson himself proclaimed, in another quotation that Dr. Ripley gave us: "The particle and the planet are subject to the same laws, and what is learned of one will be known of the other." What we have seen in a great agon of this century is that the laws are indeed profoundly different; but again there is harmony between them, and, of course, consistency.

If physics has had these extended relations with science and practice, it has still maintained a kind of central heart of its own. This is because it seeks the ideas which inform the order of nature, and of what we know of nature. Countless phenomena which, from the point of view of physics, appear calculable and explicable but not central or essential, turn out to be pivots of our understanding in other sciences. No *a priori* study of physics would have been likely to explain the accidents that make the synthesis of carbon in the stars possible. Yet that has made a difference of some importance to man. Most of the miraculous findings of microbiology were not invented, and would not have been invented, by physicists, though they have played an appropriate part in helping to provide the instruments and the language for their discovery. For every science, much is accident; for every science sees its ideas and order with a sharpness and depth that comes from choice, from exclusion, from its special eyes.

These centuries, from the first inspired studies in the Thirteenth Century of the nature of motion, to the latest journal, or even latest newspaper, have been sensed as a time of change, often painful change, of novelty, and, increasingly, of rapid growth. What is written today deploring change, or welcoming it, has its parallel in almost every decade for the last four hundred years, in Newton, in the dying Galileo, in John Donne: " 'Tis all in peeces, all cohaerence gone," wrote Donne in 1611:

"And new Philosophy calls all in doubt,
The Element of fire is quite put out;
The Sun is lost, and th'earth, and no mans wit
Can well direct him where to looke for it.
And freely men confesse that this world's spent,
When in the Planets, and the Firmament
They seeke so many new; then see that this
Is crumbled out againe to his Atomies.
'Tis all in peeces, all cohaerence gone;
All just supply, and all Relation"

But there is one very great difference. What has happened in this century in physics rivals, I think, in its technical and intellectual imaginativeness and profundity, what has happened at any time in human history. Its effects on the way we live are even more immediate and manifest than was the use of the magnet for navigation, or of electricity for communication and power; but it has not led to so great a change in man's views, of his place in the world, his function, his nature and his destiny.

The years from the Thirteenth Century to the Seventeenth saw the gradual acceptance of a material world no longer centered on man, or on his habitat, the gradual acceptance of an order in the heavens that could be described and comprehended, that sharply limited and circumscribed, though of course it did not eliminate the role of God, or indeed of accident. We should ask ourselves, I think, why the views of Copernicus, the discoveries of Galileo, the understanding and syntheses of Newton, should so greatly have resonated through European society, so greatly altered the words with which men spoke of themselves and their destiny. For nothing like that has happened with Hubble's discovery of a constant in nature, an interval of time of something like ten billion years, which characterizes the time in which galaxies double their distance from one another. Nothing like that happened with Einstein's theory of relativity, which tells us the meaning of velocity of light, or of quantum theory,

(continued from page 3)

which tells us of the meaning of the quantum. In more recent times, there is a similar contrast between the impact of the views of Darwin, and the almost total lack of general interest in Mendel's discovery of binomial coefficients in the populations of succeeding generations of peas, its rediscovery, its more recent beautiful deepening, with the great beginnings of the unraveling of its molecular basis.

To give some sharpness to my question, let me speak a little of a few of the high points of this century's physics. There are many: the discovery of new forms of order, and their very slow and gradual understanding, in the superfluid and superconducting states of matter; the discovery of the atomic nucleus itself, and the gradual unraveling of its properties, transmutations and structure; the growing insight into the properties of the ordinary materials of our world, and of special ones made to serve us. But I should like to talk of three, which at first sight seem to touch upon themes long irresistible to philosophers: the special theory of relativity, quantum theory, and particle physics. I should hasten to add that the third subject is open.

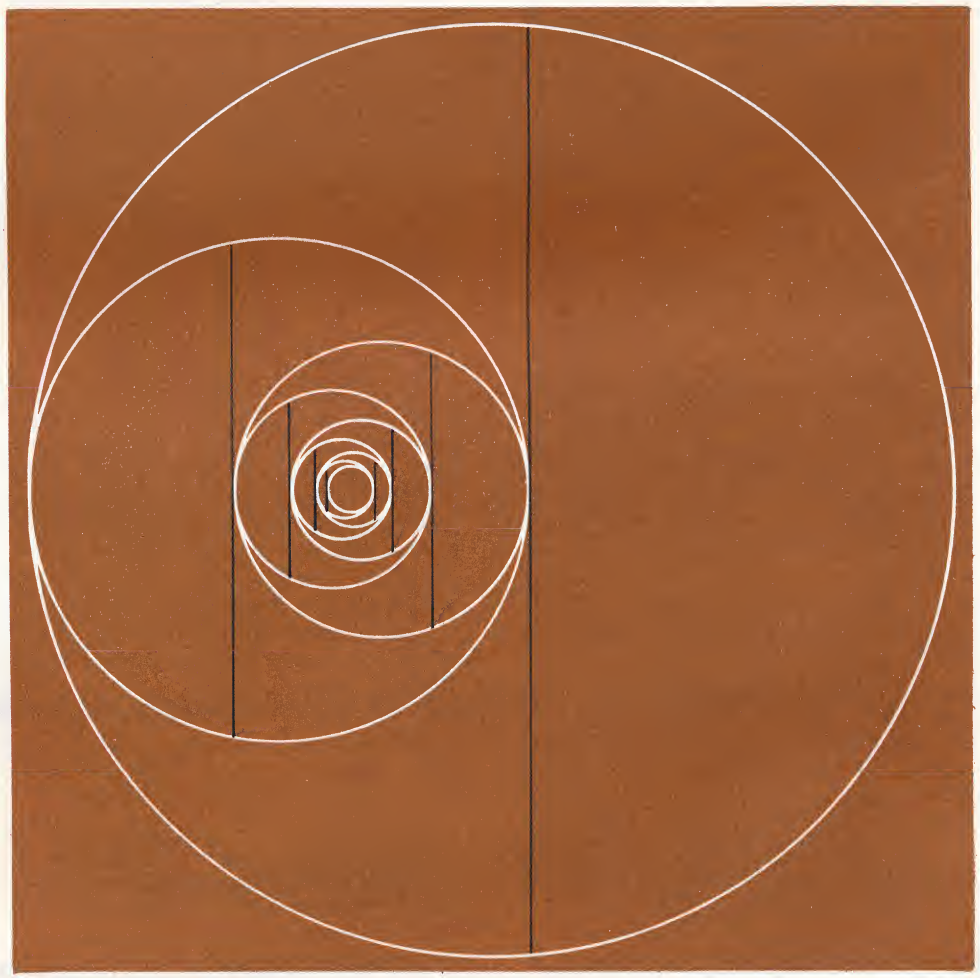
There is an analogy, long known to physicists, between the special theory of relativity and the quantum theory. Each is built about a constant of nature and has something to say about how that constant, in determining the laws of nature, restricts or enlarges our ability to learn about nature. I shall not speak of Einstein's theory of gravitation, which he called the general theory of relativity, largely because those parts of it which are assured and understood and, in part, checked by observation, were so clearly and indelibly described by Einstein that we are still not able to add much; and because those parts where Einstein felt some hesitation, or those others where no real test has so far been clearly at hand, those parts which deal with space in the very large or with truly strong gravitational fields, are still the province of the professional physicist and the astronomer.

As you all know, Einstein's first theory of relativity made clear an unexpected meaning of a constant of nature long ago determined by the astronomers, the velocity with which light propagates in empty space. It was Maxwell who showed that this constant was the same as that relating fundamental electric and magnetic units, and explained why this should be so, by showing that light is an electromagnetic wave. Einstein's role was to recognize that because of the universal validity of Maxwell's equation, and the independence of the velocity of light of the velocity of the source emitting it, this velocity must, itself, take on the role of what in earlier times was regarded as an infinite one, one which could not be surpassed. The corresponding limitations, the absence of absolute judgments of simultaneity at distant points, struck rather deep at all views of space and time ever held before. At the same time, they liberated physics to form new and consistent descriptions of nature, and by altering and refining Newtonian mechanics, to anticipate new interconnections of the most fundamental theoretical and practical import.

In some ways even more remarkable was the interpretation of Planck's constant, the quantum, that emerged from the development of the quantum theory of the atom, the work this time of many men, initiated in part by Einstein, in part by Bohr, and brought to an essential clarity by Bohr and his Copenhagen school. Here, again, physics was given a great liberation, the ability to understand the stability of atoms, the atomicity of matter, the regularities of chemistry, the atomic and molecular requirements for life, most of what physicists and chemists had known until the turn of the century. But here, again, it was discovered that the role of the quantum in the order of nature limited the traditional concepts of what we could learn about nature by experience. The quantum defines the irreducible roughness in the relations between a system being studied and the physical means —light, or beams of particles, or a gravitational field, for instance—that are used to study it. Because of this, there is an atomicity not only to the atoms and molecules, but to the traffic between them and the physical instruments of the laboratory; and, because of this, a complementary relation of mutual incompatibility between different sorts of observations on an atomic system.

From this follow all the well-known features: the ineluctable element of chance in atomic physics based, not on our laziness, but on the laws of physics; the end of the Newtonian paradigm of the certain predictions of the future from the knowledge of the present; the element of choice in the approach to atomic observation. Yet perhaps the most important lesson is that objective—and massively and beautifully successful—science could be based on a situation in which many of the traditional features of objectivity were absent, and which taught us that for scientific progress and understanding, objectivity is more closely related to our ability to describe to one another what we have done and found, to verify or refute, than to its ontological foundation.

As for particle physics, it is an unfinished story, and what we are sure of today may not yet be ready to make its contribution to the common culture. Just from the requirement that in these new domains the general principles embodied in an understanding of the quantum and the velocity of light should still apply, it follows, as has been known for more than three decades, that atoms, or particles, or the ingredients of atoms, could not themselves, as all philosophical atomists had thought, be the permanent, unchanging elements of nature. They are created, destroyed, transmuted, but do not remain unaltered. What do remain enduring are certain abstract attributes of particles, of which the



electric charge is the most familiar, and of which two other examples are known: the number of proton-like particles minus the number of their antiparticles, and the same number for electron-like particles. As for the several other abstract quantities, such as *strangeness* or *hypercharge,* and *isotopic spin* that do change, but remarkably slowly, we, I think, and I, I know, are not ready to tell philosophers of what we have made of it. This is not for lack of trying. But at the least, we have a rather unexpected alteration of the ancient atomists' answer to the problem of permanence and change. What lies ahead, we do not know. In the tumult of discovery and conjecture I have, myself, great hope; but whether we will be led, as has been so long speculated, to some further limits on what we can say about events in space and time on the scale of the very small, or whether the true shock will be far more shocking, I, at least, have an open mind. It may, though we hope not, and I believe not, be like *The Beast in the Jungle.*

But there is at least one other relatively new set of discoveries which may teach us rather deep lessons. No one was prepared for the power of the radio galaxies, or the apparently fantastic luminosity of the quasi-stellar objects. Some have thought that we were seeing the effects of truly strong gravitational fields; but until we understand better how such effects could lead to what is observed, until we understand better why galaxies are so much more effective in converting energy to radio emission than the sun is, or than we on earth are, this had best be left in the province of the professionals.

Now these, as other discoveries of this century, past and still to be made, find their way into our schools and become part of the language and the insight of new generations, and provide new attitudes and new analogies in looking at problems outside of physics, outside of science, as has already so largely happened with classical mechanics, and with electricity. But it is clear that these discoveries, which were not easy to make, and which, to the professionals involved, brought a sense of terror as great as that which touched Newton, have clearly not changed our philosophy, either in the formal sense or in the homely one. They were unexpected and beautiful discoveries for whose general import Locke and Hume, above all Charles Peirce, and even William James could have prepared us.

I have sometimes asked myself when a discovery in science would have a large effect on beliefs which are not, and may perhaps never be, a part of science. It has seemed clear that unless the discoveries could be made intelligible they would hardly revolutionize human attitudes. But it has also seemed likely that unless they seemed relevant to some movement of the human spirit characteristic of the day, they would hardly move the human heart or deflect the philosopher's pen. I now think that it can be put more simply. These syntheses, these new discoveries which liberated physics, have all rested on the correction of some common view which was, in fact, demonstrably in error: they have all rested on a view which could not be reconciled with the experience of physics. The shock of discovering this error, and the glory of being free of it, have meant much to the practitioners. Five centuries ago the errors that physics and astronomy and mathematics were beginning to reveal were errors common to the thought, the doctrine, the very form and hope of European culture. When they were revealed, the thought of Europe was altered. The errors that relativity and quantum theory have corrected were physicists' errors, shared a little, of course, by our colleagues in related subjects.

A recent vivid example is the discovery of the non-conservation of parity. The error which this corrected was limited to a very small part of mankind. There is a still more recent example, the non-conservation of combined parity, more limited still in the number of us who could be shocked by it, not yet understood, but with hopeful, though still unpublished and unverified, indications of its possible deeper meaning.

Thus I think it is true that only at the beginnings of a science, or only in a society in which an awareness of the problems of science is extraordinarily widespread, can its discoveries start great waves of change in human culture. Just possibly if, in years ahead, other examples, other forms, other sites of life should be discovered, we would have a valid analogy to the great shock of the last century, when the anthropologists showed us the unimagined variety of human institutions. Although the Nineteenth Century discoveries in biology had gone far to relate man to other forms of life, although anthropologists had revealed the unanticipated diversity of beliefs, values and practices in different cultures, and the lack of universality of the ideals by which our own society had been nourished, although the psychologists had brought some supplement to the great religions in revealing again the universal traits of evil in all men, in fact these discoveries were to deepen and not to erode the sense of a universal human community.

If the impact of the developments in physics in this century on the general understanding of man has been restricted, quiet, and largely reserved for the young and the future, their practical consequences, along with those of all the natural and mathematical sciences, have been unrivalled in their sharpness and immediacy. Many of the papers in this symposium are addressed to this vast theme. I should like to speak of one, which is not isolated, in which, largely by accidents of history, the part of physics has been important: the new weaponry, the new situation of the nations and of war. It is still not clear in what way, or even whether, these developments will turn out to be important for human history. I should think it likely that they would be. These developments, and problems that they raise, cannot be lived out in isolation from all the others which characterize our time, but only concurrently. But they can be talked about in a certain isolation.

It is twenty years ago that men generally learned of the new weapons of a new order of destructiveness. At this time we knew and told our government, as no doubt experts in other countries knew and told theirs, that the bombs that cruelly, yet decisively, ended the Second World War were, from a technical point of view, very much a beginning, not an end. We thought of some ideas about using deuterium and ordinary uranium to increase their power a thousandfold; we thought of the probable appropriateness of delivering such objects by rocket. We did not know too much about it; but within a decade, rather much had been learned.

When I think back to the summer and the autumn of 1945, I remember a number of views of the future which were formulated in this country, and, despite pre-occupation with recovery from the terrible war, no doubt abroad. The simplest, and the only one which has been decisively refuted, was that these weapons would remain a monopoly, and thus either play very little part, or put to the test only the restraint, compassion, and fortitude of our own people and government. This was not my colleagues' view, of course, nor mine; but for a time, at least, it was that of many, including some of the very highest officers of our government.

Others pointed to the long history of warfare, and talked of a defense against atomic bombs. In no meaningful sense has this characterized any period of the last two decades. As long as the armaments race continues, we will have to ask and reask whether adequate new defenses may be possible. They have not been. Thus, we have lived these years with a complementary and opposed dependence on pre-emption and deterrence.

Others, looking to past history, trying to look to the future, saw only the certain eventuality of apocalyptic war, postponed in all likelihood by the efforts of statesmanship until it was quite total. This is one forecast that history will never totally disprove. And still others, looking to the past with their eyes, and trying to penetrate the future, held, with Sir Llewellyn Woodward, that such self-defeating weapons would be put to one side, leaving the nations to war on one another with more limited means. There is some support for it in the wars of the present hour.

Yet there were quite other thoughts. Colonel Stimson wrote of *the necessary government of the whole;* and Mr. Grenville Clark then as now tried to accommodate the needs of world order with the freedom, the diversity and the self-interest of the world's peoples; Einstein said simply that world government was the only answer. To the Acting Secretary of State, the more importunate appeals led him to suggest that it was not always helpful to replace a difficult problem by an insoluble one.

Most of us recognized how central the relations with the Soviet Union would be, and, very soon, how ominous their course. Most of us recognized that with any *government of the whole* capable of serving as a vehicle

advancing common interests, the extraordinary diversity of the nations and regions and for common aspirations, for expressing and peoples of the world would present hard problems. There were rich people, and there were very poor people; in any common society these inequalities would more and more become inequities, and the inequities more and more the source of grievance and of guilt. Even in that world which had long lived with the European heritage, with a deep —though changing—Christian sensibility, differences of history, differences of political practice, conflicting assessments of the value and meaning of freedom, made talk of the world's community of interest rather a falsetto clarion. We did not then know, but we should have, that in vast parts of the world, in Asia, in Africa, the first, the most powerful, the most spectacular of Europe's legacy would be the lure of technology, the pleasure of privilege, and the delights of an often synthetic nationalism. We knew that the rich could not, if they would, and perhaps would not, quickly reverse the inequities in conditions of life among peoples. We knew that for the world's future the variety of historical experience, the differences of tradition, of culture, of language and the arts, should be protected and preserved. This left very little of the idea of government of the whole; but it did leave something.

In June of 1945, before the first bomb, four of us, Arthur Compton, Fermi, Lawrence and I, wrote, in answer to questions put to us by Colonel Stimson, the Secretary of War: "To accomplish these ends, [the rapid and in human life the least costly end of the war, and the preservation of the future peace of the world], we recommend that before the weapons are used not only Britain, but also Russia, France and China be advised that we would welcome suggestions as to how we can cooperate in making this development contribute to improved international relations." These views were endorsed by the Secretary of War's Interim Committee on Atomic Energy, though the Committee, of course, paid little attention at that moment to France, and to China. But in fact no meaningful communication was made at all: no attempt to enlist our then allies in a common responsibility and a common concern. That would have been a moment to begin to worry about what is now called "nuclear proliferation," for we and our then allies are the five powers that today have a known nuclear military program. I think that we will not be very successful in discouraging other powers from this course unless we show, by our own example and conviction, that we regard nuclear armaments as a transitory, dangerous and degrading phase of the world's history, that before other nations could have competing armament, there is a good chance that armament will have become archaic.

In writing as we did in 1945, and then, of course, very much more later, we were not unaware of the diversity of condition, interest, philosophy and political institutions even in the great powers of the world, and certainly in the world at large. But we did know one thing from our experience before and even during the war: we knew something of the universality of the practice, language, discourse and ethos of science. Los Alamos, and other wartime laboratories, were indeed international institutions. For years before the end of the war, those responsible for the organization of the scientific effort in this country—Vannevar Bush, and James Conant, and many others—had been speaking of the hope of an international control of the new weapons, and a cooperative exploitation of the new sciences. Similar views were widely held in Britain. Sir John Anderson, who was the head of the United Kingdom Uranium Project, was persuaded of them. Most of all, Niels Bohr explored these possibilities in depth, recognizing that any such cooperation and any such control would have to rest on open access in all countries, and recognizing that this was the best guarantee against the self-delusion and the cultural and political and human abuses of societies that seal themselves off from their fellow men.

The years since the war have brought many examples of effective and fruitful international collaboration, in technology, in political economy, above all in the sciences. My own field just in the last years has been enriched by contributions of the greatest value from physicists whose countries a century ago were quite closed to the scientific tradition of Europe: Korea, Japan, China, Indochina, to name a few. We need to be grateful for the strength and beauty of this tradition, and to tremble as well as take heart in its power. These same years have also shown how modest, how fitful and inconstant, how easily overwhelmed has been the effect of these international communities on the nations and the governments.

If I recall at this celebration some notions of two decades ago, it is clearly because I believe them essential to our present and our future. For I see it as a crucial question of our time whether, in a world destined at best slowly to relieve the inequities of rich and poor, the exploitation of military technology, of national pride, of privilege, will be met by the growth, in practice, in sensibility, in institutions, of a community of interest and understanding. In the discouragements of the day, good example must come to be our firmest ground for hope.

Dr. Oppenheimer is at The Institute for Advanced Study. This essay is taken from Perspectives in Modern Physics, *a dedicatory volume on the occasion of Hans A. Bethe's sixtieth birthday, edited by Robert E. Marshak.*

Authors' Honors

ROBERT S. MULLIKEN of the University of Chicago and Florida State University has won the 1966 Nobel Prize for Chemistry, primarily for his work on molecular orbital theory. Professor Mulliken is co-author with Professor Willis B. Person of the University of Florida of *Molecular Complexes: A Lecture and Reprint Volume.*

VLADIMIR KOSMA ZWORYKIN was a recipient of the National Medal of Science "for major contributions to the instruments of science, engineering and television, and for his stimulation of the application of engineering to medicine."

HENRY EYRING received the National Medal of Science "for contributions to our understanding of the structure and properties of matter, especially for his creation of absolute rate theory, one of the sharpest tools in the study of rates of chemical reaction."

SUBRAHMANYAN CHANDRAESKHAR received the National Medal of Science "for numerous superb contributions to stellar astronomy, physics, and applied mathematics, and for his guidance and inspiration to his many students and colleagues." Dr. Chandraeskhar is a member of the Editorial Advisory Board, Interscience Monographs and Texts in Physics and Astronomy.

JOSEPH EDWARD MAYER, Professor of Chemistry at the University of California at San Diego, received the Charles Frederick Chandler Medal in ceremonies at Columbia University. Dr. Mayer was cited for two decades of research on the behavior of gas molecules.

JOSEPH A. LITTERER received the eighth annual Organization Development Council Publications Award for his book, *The Analysis of Organizations.* The book was chosen as outstanding among a number of volumes concerned with the subject of organization published during the last year.

ROGER M. BAKKE, Staff Engineer with International Business Machines Corporation, received the third annual Donald P. Eckman Memorial Award at the Joint Automatic Control Conference held at the University of Washington.

RALPH G. PEARSON received the 22nd Midwest Award of the American Chemical Society for his contributions to organic and inorganic chemistry.

W. ALBERT NOYES, JR., delivered the Werner Kuhn Memorial Lecture at the University of Basel, Switzerland, in September. Dr. Noyes was President of the American Chemical Society in 1947.

GARETH THOMAS received the Curtis W. McGraw Award for his contributions to metallurgy as a pioneer in transmission electron microscopy of metals and alloys, and in nucleation and growth of crystals in the solid state.

OCTAVE LEVENSPIEL received the Chemical Engineering Division Lectureship Award of the American Society for Engineering Education. The lecture is presented annually at the Chemical Engineering Division Banquet.

RUFUS ISAACS shared the Lanchester Prize for the outstanding article or book published during the past year on operations research with Professor Michel L. Balinski of the City University of New York. Dr. Isaacs, a strategic defense specialist, was presented the award during the National Operations Research Society meeting for his book, *Differential Games.*

HAROLD CHESTNUT received an honorary Doctor of Engineering degree from Case Institute of Technology. Dr. Chestnut is an authority in the field of cybernetics and systems and has published books in both areas.

ROBERT L. METCALF received the Charles F. Spencer award given by the Kansas City Section of the American Chemical Society. The award is given for distinguished achievements in agricultural and food chemistry. Dr. Metcalf, chemist and entomologist, has been working with anticholinesterase insecticides for twenty years.

A National Policy Statement on International Book and Library Activities, drafted at the request of the Secretary of State by the Government Advisory Committee on International Book Programs and approved by President Johnson on January 4, has been issued to all agencies concerned with international book and library programs of the Government. W. Bradford Wiley is Chairman of the Government Advisory Committee. The text of the statement follows:

In his message to Congress of February 2, 1966, the President said, "Education lies at the heart of every nation's hopes and purposes. It must be at the heart of our international relations." Books, by definition, are essential to education and to the achievement of literacy. They are also essential to communication and understanding among the peoples of the world. It is through books that people communicate in the most lasting form their beliefs, aspirations, cultural achievements, and scientific and technical knowledge.

In the United States and other developed countries, where there has been the opportunity for a long time to emphasize education and books, there have been created vast resources of printed materials and other forms of recorded knowledge in all fields of human endeavor. In the United States, a great complex of library systems has emerged, serving ordinary citizens as well as students and scholars. In the developing countries, where more than two-thirds of the world's population live, there is an acute need for the books essential to educational growth and general social progress, and for libraries which can enable these nations more easily to acquire and use the technology of the modern world. The United States Government declares that it is prepared, as a major policy, to give full and vigorous support to a coordinated effort of public and private organizations which will make more available to the developing countries these book and library resources of the United States which these countries need and desire.

The total needs of the developing countries with regard to books cannot be adequately filled by assistance from the outside; nor, under present conditions, can they be filled from local resources. From a long-range point of view, the establishment of viable book publishing and distributing facilities in the developing countries and regions is essential. It shall therefore also be the policy of the United States Government to encourage and support the establishment of such facilities.

The utility of books goes beyond their contribution to material progress. The free and full exchange of ideas, experiences and information, through books, is indispensable to effective communication between people and nations, and has a unique role to play in the enrichment of the human spirit. Recognizing this, the United States Government is further prepared, as a major policy, actively to promote the free flow of books and other forms of recorded knowledge.

The task of filling the world's need for books and of achieving an adequate exchange of books among the nations is immense. No single institution or agency and no single government can hope to accomplish it alone. It is therefore essential that all agencies of Government concerned in any way with international book and library programs assign to these a high priority. It is further essential that they coordinate their book and library efforts with those of other pertinent government agencies and private institutions. Agencies will propose to the President for transmittal to the Congress any requirements for new legislation or special funds to carry out this policy. All agencies of Government, under the direction of the Department of State, should actively seek to cooperate with other governments on a bilateral or multilateral basis in the achievement of these objectives.

The Assistant Secretary of State for Educational and Cultural Affairs has the responsibility for coordinating United States Government efforts in this field.

Wiley 'round the World

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1 At the Franklin Book Programs Annual Meeting, Esther Walls, Assistant Director of the Franklin Africa Division, presents a Benin bronze to W. Bradford Wiley, outgoing Board Chairman, and Mrs. Wiley.

2 West German President Heinrich Lubke at the Wiley exhibit during the International Book Fair in Frankfurt. At his left, President Friedrich George of the Boersenverein des Deutschen Buchhandels. In the background, Fritz Weg of Wiley's London office.

3 Honorary degree recipients at Colgate University's 145th Commencement last May. Pictured above are W. Bradford Wiley; Clifton W. Phalen, Chairman of the Board of the New York Telephone Company; Commencement Speaker Chakravarthi V. Narasimhan, Chef de Cabinet to U.N. Secretary General U Thant; Colgate President Vincent M. Barnett, Jr.; Max Black, Susan Linn Sage Professor of Philosophy at Cornell University; and Kermit Gordon, Vice President of the Brookings Institution. Mr. Wiley received a Doctor of Laws degree.

The U. S. Regional Technical Aids Center in Mexico City officially launched a university textbook program for Latin America last October with the signing of contracts for the first of scores of science texts to be translated and published this year under RTAC sponsorship.

4 Carlos Noriega, President of Editorial Limusa-Wiley, S. A., signs the first contract as Mario Gonzalez, RTAC/Mexico Program Assistant, looks on.

John Wiley & Sons Australasia Pty. Ltd. has just completed a new office building and warehouse in Sydney. The new building will serve as distribution center for text and reference books to Australia, New Zealand, Papua, Fiji, Samoa, and New Guinea.

5 Exterior of the building at 110 Alexander Street.

6 Main reception area, Miss Carmel Trasey, Receptionist.

7 Architect's drawing of Wiley's new Eastern Distribution Center. Now under construction in Somerset County, N. J., the Center is expected to be completed in August, will provide nearly 150,000 square feet of office and warehouse space.

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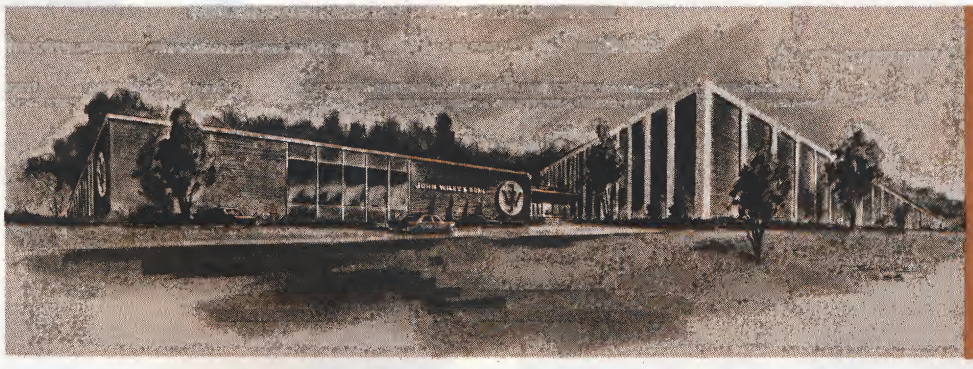

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(continued from page 1)

St. Louis—as well as the advice of more than a dozen other scholars at major universities in the United States and Western Europe, and the work of a research staff. Research utilized in this book, as well as in the present article, was supported in part by the United States Arms Control and Disarmament Agency (A.C.D.A.). Any judgments or opinions expressed here or in the book are, of course, those of the author and do not necessarily reflect the views of A.C.D.A. or of any other department or agency of the United States Government.

The results of the study, comprising several thousand pages of typescript and computer printout, were surveyed in several book-length reports by various participants, and they were summarized and evaluated in a longer overall report by the present author. This report treated as a single interdependent complex the problems of arms control and disarmament in Europe, the foreign policy attitudes of the elites and masses of France and Western Germany, and the prospects for European integration. Though makers or analysts of policy may find this stress on interdependence useful, the interests of many readers—as well as of many academic teachers and students—are more specialized. Accordingly, *Arms Control and the Atlantic Alliance* is a short book which centers its attention upon possible arms control and disarmament policies and their probable reception in Western Europe. Data and findings on French and German politics and European integration are used here mainly for the necessary context.[1]

The Main Questions of Substance

What are the attitudes of Europeans to arms control and disarmament now, and what are they likely to be over the next ten years? What specific steps or measures of arms control and disarmament might they accept?

These questions imply others. Do Europeans want more tension or less among the great powers? Is Europe now already an emerging political unit, speaking and acting as one, or is it likely to be such a unit in ten years? Or is it remaining the geographic location of competing nation-states? Or is it becoming a "Europe of fatherlands," that is, of nation-states acting in limited alliance, but preserving most of the substance of their sovereignty?

Within these general attitudes and trends, what are the prospects of specific policies? How representative of more long-lasting aspirations of French leaders and voters are the current foreign policies of President de Gaulle, such as his insistent assertion of more far-reaching French equality vis-a-vis the United States and within the Atlantic Alliance? What do the French think, and what do their neighbors think, of France's small national nuclear striking force, the *force de frappe?* Do the Germans want national nuclear weapons, and what do the French think about such a prospect? What are European attitudes toward the old proposal of a multilateral nuclear force (M.L.F.) which would include Western Germany, with or without the United States? Given these realities of European politics, what arms control, defense and alliance policies of the United States would best accord with them within the limits of the national interest of the United States?

Evidence and Methods Used

Questions of this kind can only be answered by a combination of evidence and judgment. Every piece of evidence derives its meaning from the prior knowledge of the person who uses it. For meaning is context, or more precisely, it is the change produced in a context known to a receiver, that is, stored in his memory. Evidence about the views or actions of certain French or German leaders or voters is only meaningful when it is interpreted against a background knowledge of French and German history and politics. This responsibility for the decision of what is worth knowing, the recognition of what is relevant, and the interpretation and judgment of evidence—this responsibility is inescapable and personal. At the same time, it is professional, for it is based on experience, scholarship, competence and skill, for all of which there exist at least to some extent professional standards.

Despite such professional standards, unaided judgment is too personal to be reliable, or on the contrary, it is too vulnerable to the pressures of group conformity. The same facts may mean different things to different judges or scholars, according to their different memories, experiences, life situations, biographies and personalities; or else they may be too easily swayed into agreement by the seductions of togetherness. It takes the careful use of many facts, therefore, brought into the form of reproducible evidence—evidence that can be verified impersonally—to keep the inescapably individualistic or conformist judgments of men at least within a tolerably small distance from reality and from each other.

In our study, we tried to aid and guide our judgments by five different streams of evidence.

The first of these consisted in the results of extended elite interviews, conducted in mid-1964 by experienced American scholars in France and Germany, the two key countries of European politics. These interviews averaged one-and-a-half hours each in length and included 147 leaders in France and 173 in the German Federal Republic. These leaders represented six major occupational groups: political leaders, high civil servants, the military, businessmen, mass media leaders and university professors, and non-business interest groups, including labor unions, farm organizations and church groups. Immediately after each interview, the views and attitudes of the respondent were recorded and coded by the interviewer in accordance with a detailed questionnaire which had guided his unobtrusive earlier conduct of the interview; and the results—including data showing on which points the respondent had not commented—were then put on punch cards and subjected to analysis.

The second type of evidence was obtained from mass opinion data for France, Germany, Italy and Britain, covering the 1952-1965 period. The third type came from the computer content analysis of four leading newspapers for the years 1953 and 1963—*Le Monde* of Paris, the *Frankfurter Allgemeine Zeitung,* The London *Times,* and *The New York Times*—and from the "hand" content analysis of relevant issues of a much larger number of periodicals in the same four

1. *Another book, focussing upon elite attitudes in France and Germany in regard to European integration and a much broader range of domestic and foreign policies, and treating arms control problems only briefly, is being published by K.W.Deutsch, L.J. Edinger, R.C.Macridis and R.L.Merritt,* France, Germany and the Western Alliance *(New York: Scribner's,* 1967*). This division of an originally unified study into two more specialized books, each corresponding to the needs and interests of a distinct circle of readers—and of distinct groups of academic specialists, teachers and courses—has required an inevitable limited overlap of some material needed for background and coherence in each book; and it has required the co-operation of both publishers, which is gratefully acknowledged.*

countries for the period 1947-1963.

The fourth type of evidence came from a survey of arms control proposals for Europe from 1946 to 1963. The fifth type finally came from the analysis of a large body of aggregative data of the actual behavior of European countries and populations, such as the international flow of trade, of mail, of travelers, and of university students among them and to the rest of the world from the 1920s to the 1960s.

Some Major Findings

On the whole, the results from our five streams of evidence converged and tended to reinforce each other. A few of our main findings may be summarized here.

The fundamental integration of Western Europe has halted since the mid-1950s. This integration grew from 1913 to 1954, then slowed down, and it has been at a virtual standstill on its plateau since 1957-58. Only minorities of the leaders in both France and Germany—less than one in five in France—except Europe to become united within the next ten years. On the level of mass opinion, national issues tend to outpull European concerns fifteen to one among all German voters, and still ten to one among the young. France's trade with the rest of the European Economic Community (E.C.C.) in 1963 was about 10 percent of its national income, a proportion slightly less than what it had been long before E.C.C. in 1928. The shift of French mass opinion away from major foreign policy views prevailing in the United States, West Germany and Britain began in 1955, three years before the coming to power of President de Gaulle.

Feelings among the elites and masses of France and Germany have improved but still fall short of trust. Three out of five French voters now feel well disposed toward Germany, and a similar proportion of West Germans reciprocate this friendliness. But only one French voter in five—and only one French leader in fifteen—indicate much trust in Germans; nor are the Germans more trustful of the French. Masses and leaders in both countries at this time much prefer to trust in the United States.

Europe for the next ten years is likely to remain a Europe of nation-states—of "fatherlands," as President de Gaulle once put it—with their distinct national political and military establishments. During the next ten years, age and retirement will remove many of the somewhat more internationalistic European leaders born before 1900, who still remember the relatively peaceful pre-Hitler Europe of Aristide Briand and Gustav Stresemann. These men will be succeeded by the somewhat more nationalistic generation whose minds were molded by the Depression and the Second World War, by the Nazi regime and by the decisions between serving it or resisting it. During the next ten years, almost all the top senior posts in the civil service will go in France to men of this generation of the Resistance; in Germany, they will go almost completely to men who entered the civil service under Adolf Hitler. The younger generation of leaders, those now under 50, will reach the top in most cases only after 1975. These men are again about as internationalist and pro-European as the oldest generation which is now retiring. After 1975, new advances toward the substantial unity of Europe are likely, at least on this account, to find a more favorable reception among the leaders of both countries.

Though there will be a period of nation-states, the next ten years are not likely to be an era of extreme nationalist policies. Strong majorities of leaders in both countries prefer a foreign policy of alliances, rather than of isolation, as the best means to further the interests of their country. The ally overwhelmingly preferred by the elites in both countries is the United States, followed at some distance by Britain. Both French and German leaders clearly favor British membership in the European Common Market. They also favor further limited steps toward European integration, and in general, limited reductions in national sovereignty, so long as the essentials of the nation-state remain in regard to the national power of decision over economic or political matters of vital concern.

Both masses and leaders in France and Germany definitely favor the relaxation of tensions among the great powers, particularly between the United States and the Soviet Union. About 72 percent of voters polled in France and Germany say that such relaxation would be good for their country; only 16 percent in Germany—and less in France—are more afraid of a great power bargain at the expense of their country. Among leaders, support for international relaxation of tensions is similarly high. In particular, improved relations to the countries of Eastern Europe were overwhelmingly expected in 1964 by French and German leaders, foreshadowing the actual improvements that took place in 1964-1966. The character of West Germany's new coalition government, and Chancellor Kurt Kiesinger's policy speech to the Bundestag on December 13, 1966, once again expressed these prevailing and continuing sentiments of the German masses and elites.

Arms control and disarmament were backed by substantial majorities of French and German leaders. They feared the spreading of nuclear weapons to additional countries; and they preferred to see these weapons limited to those countries now possessing them. i.e., the United States, the Soviet Union, Britain, France and Mainland China. American-Soviet agreements restricting nuclear tests—such as the partial test ban of 1963—were endorsed, and future agreements of this kind were hoped for. This support included particularly any American-Soviet agreements to halt the spread of nuclear weapons to countries not now possessing them; and it included arms control agreements, specifically, even if in concluding them the great powers should not consult the respondent's own country.

Among arms control measures, those on a

worldwide or nearly worldwide scale were clearly preferred by French and German leaders. Arms control and disarmament proposals limited to Central Europe were turned down; many feared that Central Europe might become a military vacuum in an otherwise heavily armed world.

National nuclear weapons were not popular. In France, majorities of leaders rejected a "national deterrent" as not necessary to a nation's independence and prestige, and as not credible to its enemies; but they split evenly—46:46 percent—on the question whether a national nuclear weapons system —i.e., the *force de frappe*—was worth its cost. Most French leaders emphatically rejected nuclear weapons for Germany and most German leaders rejected them for France.

An overwhelming majority of Germans, however, also rejected nuclear weapons for Germany, as neither necessary nor credible, and—this by a staggering 95 percent—as not worth the cost. So far as we could discover the claim, sometimes echoed in the press, that there is a strong German demand for national nuclear weapons, which must be appeased or headed off by giving West Germany a share in some multilateral nuclear weapons system, appears to be a myth. There is no significant strength behind any such demand in West Germany, among either masses or elites.

The proposal for a multilateral nuclear force (M.L.F.) tends to divide European opinion rather than unite it. An M.L.F. within the NATO system, and hence in large part under American control, is definitely rejected by the French leaders; and it splits the German elites evenly, with only 34 percent clearly in favor, and another 34 percent clearly opposed. An M.L.F. force outside NATO is endorsed by a strong minority among the French, but it is definitely rejected by four-fifths of the German leaders. If a multilateral nuclear force under NATO should become an accomplished fact, however, then three-fifths of the German leaders—but only one-sixth of the French—definitely would want their own country to join it. In short, there is no strong spontaneous German drive for an M.L.F., only an interested minority balanced by an equally large minority in opposition. Germany's interest in nuclear weapons would have to be aroused and largely created by actions of the United States.

Most of these attitudes are likely to persist. Neither French nor German leaders expect to change their minds or their basic policies in the future they envisage. The effects of age differences are minor now, and likely to remain so for the next ten years. In many respects—though not in all—the foreign policy of President de Gaulle expresses widespread and long-lasting aspirations of French masses and elites, which are likely to persist under his successors. In West Germany, the recent flurry of an 8 percent vote for the far-right or Neo-Nazi National Democratic Party in two provincial elections in 1966 has remained well within the 10 to 12 percent fringe of extreme nationalist and pro-Nazi attitudes and votes familiar from the last 20 years of German politics. That so many of these fringe votes should have been gathered by a single well-led and well-financed party gives legitimate cause for concern, but it should not obscure the fact that over 90 percent of the West German voters and leaders continue to prefer parties publicly committed to peace and to the democratic way of life.

Some Opportunities for Policy

The implications of these findings may be worth some speculation. The United States' policies of arms control and disarmament could do much to strengthen peace and stability in Europe. Worldwide agreements to limit nuclear proliferation and to preserve a world of five nuclear powers, including France and Mainland China, but excluding Germany, would be acceptable to European leaders. So might be a four-power political directorate, consisting of the United States, Britain, France and the German Federal Republic, guiding a reformed NATO organization, and supplemented by a three-power technical subcommittee on nuclear weapons, consisting of the United States, Britain and France.

If such a reformed NATO organization were to meet the persistent French demands—and the similar though quieter wishes of other European powers—for greater substantial equality in the making of NATO decisions affecting war and peace, then the United States, like every other NATO member, eventually would have to give up the sovereign right to initiate or escalate a major war without the explicit consent of its allies. It may take some time before this degree of equality becomes acceptable to American opinion.

In the meantime, however, European opinion seems ready to support a wider range of possible United States initiatives for steps toward worldwide disarmament and arms control. A visible limitation at this time of American military and political commitments in Asia might substantially increase United States resources and opportunities for exercising leadership in Europe.

Professor Deutsch, presently at Yale University, will be joining the faculty of Harvard University in the fall. He is the author of Arms Control and the Atlantic Alliance, *just published.*

Convention Schedule

Wiley is represented at the following meetings and conventions. Members of the Scientific Community and others are invited to visit our representatives on these occasions.

January	
American Mathematical Society	Houston, Texas
American Physical Society	New York, New York
February	
American Association of School Administrators	Atlantic City, New Jersey
National Association of Secondary School Principals	Dallas, Texas
March	
National Association of Independent Schools	New York, New York
Pittsburgh Conference	Pittsburgh, Pennsylvania
American Association for Health, Physical Education & Recreation	Las Vegas, Nevada
Association for Supervision & Curriculum Development	Dallas, Texas
National Science Teachers Association	Detroit, Michigan
Institute of Electrical and Electronics Engineers	New York, New York
National Catholic Education Association	Atlantic City, New Jersey
April	
American Chemical Society	Miami Beach, Florida
Association of American Geographers	St. Louis, Missouri
American Physical Society	Washington, D.C.
Federation Meeting	Chicago, Illinois
Spring Joint Computer Conference	Atlantic City, New Jersey
National Council of Teachers of Mathematics	Las Vegas, Nevada
National Society for Programmed Instruction	Boston, Massachusetts
National Association of College Stores	Miami Beach, Florida
American Society for Microbiology	New York, New York
June	
American Booksellers Association	Washington, D.C.
American Association of Physics Teachers	Canton, New York
American Society for Engineering Education	East Lansing, Michigan
American Library Association	Dallas, Texas
Siam National Meeting	Washington, D.C.
July	
Marine Biological Laboratory	Woods Hole, Massachusetts
August	
American Institute of Biological Sciences	College Station, Texas
American Accounting Association	
American Mathematics Society	Toronto, Canada
American Sociological Association	San Francisco, California
American Marketing Association	
American Psychology Association	Washington, D.C.
September	
American Political Science Association	Chicago, Illinois
American Chemical Society	Chicago, Illinois
October	
National Electronics Conference	Chicago, Illinois
November	
Fall Joint Computer Conference	Anaheim, California
Geological Society of America	New Orleans, Louisiana
December	
American Economic Association	Washington, D.C.
American Statistical Association	Washington, D.C.
American Historical Association	
American Association for the Advancement of Science	New York, New York

Books

A subject guide to recent and forthcoming Wiley books of exceptional interest

Biology

BLACKWELDER (Southern Illinois University)
Taxonomy: A Text and Reference
This book is *about* taxonomy *for* taxonomists, dealing with practical and theoretical aspects of classification. It contains extensive reference material in bibliography, synonymy, nomenclature, and the use of literature, covering the range from the simplest and most practical aspects to the theory of classification and the rules for naming animals.

BOOLOOTIAN (University of Colorado)
The Physiology of Echinodermata
Authorities in their fields have written this detailed account of echinoderm physiology. The book reviews all existing knowledge on the subject and presents heretofore unpublished information as well. A valuable bibliography is included which contains all major publications dealing with echinodermata.

NELSON (University of South Florida)
ROBINSON (University of South Florida) &
BOOLOOTIAN (University of Colorado)
Fundamental Concepts of Biology
An introductory volume that presents the major principles from seven important areas of contemporary biology: cell structure, energy acquisition and utilization, control mechanisms, reproduction and morphogenesis, genetics, evolution, and ecology.

Books of General Interest

PELZ & ANDREWS (both at The University of Michigan)
Scientists in Organization
Based on extensive data from over 1300 scientists and engineers in industrial, government, and university laboratories, this book represents one of the first major research studies of the relationship between the performance of a scientist or engineer and the organization of his laboratory. The work includes many easily understood charts and tables, a complete description of the research on which the findings are based, and numerous practical suggestions about the implications of these findings for the professional lives of technical people and for the organization of research and development laboratories.

Business Administration

BEER
Decision and Control (2 Volumes)
A detailed study of management and the way in which it may invoke the use of science to help solve problems of decision and control. Part I identifies the area of overlap wherein lies the scope for operational research. Part II investigates, Part III draws especially on the science of cybernetics. And in the final part there is a discussion of outcomes—for industry, for automation, for government, and for the profession of management science itself.

CARSON (Boston University)
Comparative Marketing Systems: An International Perspective
An initial attempt to integrate the considerable amount of material available on marketing in various nations into a unified approach to comparative marketing.

GIST (Oregon State University)
Management Perspectives in Retailing
A collection of recent articles which reflect conceptual or analytical approaches to issues and problems in retailing. The articles were selected because they embody an imaginative and stimulating perspective.

MALLEN (Sir George Williams University, Montreal)
The Marketing Channel
A social and theoretical analysis of the concept of the marketing channel field. It brings together the most significant conceptual articles, chapters and papers in the field.

RYANS & BAKER (both at the University of Maryland)
World Marketing: A Multinational Approach
A book of readings dealing with the major aspects of international marketing. Many readings have been selected which are either written by foreign authors or are taken from foreign publications.

SILVERMAN (Kearfott Division, General Precision, Inc.)
The Technical Program Manager's Guide to Survival
A basic manual giving a step-by-step description of the design, development and production of a product under the Program Management concept. It explores the problems that can arise along the way and suggests solutions to these problems.

Chemical Engineering

FRANKS (E.I. du Pont de Nemours & Co., Inc.)
Mathematical Modeling in Chemical Engineering
The material in this book describes the new approach to chemical process problems that has evolved over recent years as a result of the rapid development of problem-oriented computer techniques. The basic aim is to encourage chemical and process engineers to consider the analytical approach to problems.

Chemistry

BASOLO & PEARSON (both of Northwestern University)
Mechanisms of Inorganic Reactions, Second Edition
A study of the mechanisms of reactions of certain inorganic systems in solution. The mechanisms of these reactions are examined in detail in order to understand why certain reactions occur readily, and others slowly or not at all, and to understand why certain products are formed and others are not.

MUETTERTIES (E. I. du Pont de Nemours & Co., Inc.)
The Chemistry of Boron and its Compounds
In this introduction to the chemistry of boron, all the major areas are presented by recognized experts in the various fields. The structural definition of boron and its compounds is a pervasive theme, and this theme is the basis for an organized presentation of the chemistry. It is the only book that presents a characterization of all major areas and has the most up-to-date information. It will be of value both to the expert and—because the exposition is complete—to the non-expert.

SOLOMON (Chemical Research Laboratories)
The Chemistry of Organic Film Formers
Discusses the basic chemistry involved in the preparation of polymers for use as surface coatings. The chemistry of the film forming processes is considered in detail together with the influence of catalysts, temperature, etc., on their crosslinking reactions. Throughout the book, the approach to the subject is from the viewpoint of an organic polymer scientist; technological aspects are kept to a minimum.

Civil Engineering

CEDERGREN (California Department of Water Resources)
Seepage, Drainage, and Flow Nets
Presents, in one volume, methods for analyzing and designing systems for controlling seepage and groundwater in all major types of civil engineering works. The methods given do not require high proficiency in advanced mathematics.

ROBINSON (University of Southampton, England)
Structural Matrix Analysis for the Engineer
An introductory presentation of matrix analysis of complex redundant structures using both force and displacement approaches. Gives special emphasis to practical applications.

Computers, Data Processing, Information Sciences and Applications

ANDREE (University of Oklahoma)
Computer Programming and Related Mathematics
A book devoted not only to computer coding, but also to the much more important mathematical analysis related to the use of computers in the solution of problems. FORTRAN programming for the IBM/1620 is introduced. The most important feature is the superb set of problems covering a wide range of experience.

ARCHIBALD (Informatics, Inc.) &
VILLORIA (Houston Fearless Corp.)
Network-Based Management Systems (PERT/CPM) (A volume in the Wiley Information Science Series)
The authors offer a comprehensive guide to network-based, management information and control systems, including what they are, how they work, how they are put into practice, what they cost, and what some of the problems and pitfalls associated with them are. Numerous case histories, based on experience in governmental and industrial projects, and profuse illustrations serve to convey a full understanding of the concepts, benefits, potentials, problems and limitations of these powerful information systems.

BORKO (System Development Corporation)
Automated Language Processing (A volume in the Wiley Information Science Series)
This is a state-of-the-art study reviewing research on the use of computers to process natural language for information storage and retrieval. It includes stylistic analysis, machine translation, question answering and typesetting. Eleven chapters on various aspects of computer oriented language analysis are each written by a recognized expert in his field. The conclusion describes how the book's contents were type-set and indexed by computer, thus demonstrating the practicality of *Automated Language Processing*.

CARTER (System Development Corporation)
National Document Handling Systems for Science and Technology A volume in the Wiley Information Science Series)
Describes the scientific and technical document-handling and library practices and problems in the United States, and proposes detailed concepts for national document-handling systems.

INTERUNIVERSITY COMMUNICATIONS COUNCIL (EDUCOM)
Report of the Summer Study on Information Networks
An investigation of the desirability and/or feasibility of an inter-university, multi-media, reactive, electronic network and the determination of steps to be taken—technically, financially, and organizationally—in establishing such a network.

LEWIS (General Electric Research & Development Center) &
COATES (The University of Texas)
Threshold Logic
A complete exposition of the subject with emphasis on synthesis of single and multi-gate networks for controlled sensitivity. Approximately one hundred illustrative examples demonstrate the use of the synthesis procedures.

MEADOW (IBM Corporation)
The Analysis of Information Systems: A Programmer's Introduction to Information Retrieval
Deals with the problems and methods of using a computer to store, search, and retrieve information. It treats information retrieval as a communication activity among a user, a li-

Books

brary, and an author. It is aimed primarily at the reader with some computer background.

RALSTON (State University of New York at Buffalo) &
WILF (University of Pennsylvania)
Mathematical Methods for Digital Computers, Vol. II
This sequel to the well-known Volume I of this series contains an entirely new selection of material. As in the previous volume, each chapter contains a mathematical discussion followed by specifically computer-oriented sections—including a flow chart, sample problem and, in a number of cases, a program.

Earth Science

OBERT & DUVALL (both of the U. S. Bureau of Mines)
Rock Mechanics and the Design of Structures in Rock
Treats the theoretical and experimental phases of rock mechanics related to the design or stability of underground structures in rock, such as mines, tunnels, power stations, or hardened military installations.

VANDERS & KERR (both of Columbia University)
Mineral Recognition
The major aim of *Mineral Recognition* is to teach the amateur mineral collector or beginning student of minerals to recognize common minerals—an ability often referred to as "sight identification." The mineral specimens for the 287 colored photographs (48 plates) were carefully selected, mainly from the Columbia University research collection, to illustrate characteristic features of common minerals. The book also discusses some exciting aspects of crystal growth and physics.

Economics

KUENNE (Director, General Economic Systems Project)
Monopolistic Competition Theory: Studies in Impact
The book is a collection of essays by well-known economists and is structured as an appraisal of the impact upon the profession by Chamberlin's theory of monopolistic competitions. It also seeks to point out applications of the theory which might be made profitably. The essays contain many original contributions in the extension of monopolistic competition theory.

MULVIHILL & PARANKA (both of Kent State University)
Price Policies and Practice: A Source Book of Readings
A collection of twenty-four current, outstanding articles about pricing taken from various leading publications. Emphasis is placed upon the application of prices and practices in business decision making. This is the only book of readings in the area of price policies and practices within a business environment.

WEISS (University of Wisconsin, Madison)
Case Studies in American Industry
An up-to-date analysis of five important sets of markets—agriculture, electric power, steel, retailing, and steel labor—designed to provide concrete background for the major subjects covered in courses on macroeconomic theory and policy.

Education

BOWER (National Institute of Mental Health) &
HOLLISTER (University of North Carolina School of Medicine)
Behavioral Science Frontiers in Education
Presents the best in the application of behavioral science theory and practice to education.

HANSEN (University of California, Santa Barbara) &
GERSTL (Temple University)
On Education—Sociological Perspectives
An integrated symposium of six essays focusing on the areas of sociological inquiry which today appear most promising for the study and understanding of education. Three commentaries, from sociologists who have studied education in England, New Zealand, and Australia add to the perspective.

MASSIALAS & ZEVIN (both of The University of Michigan)
Creative Encounters in the Classroom: Teaching and Learning Through Discovery
Identifies ways in which the teacher may organize the curriculum and the instructional procedures in order to enhance learning. The book fully describes and evaluates the method of discovery as it has been used in teaching various school subjects.

THELEN (The University of Chicago)
Classroom Grouping for Teachability
The result of a three-year research investigation, this important new book presents the rationale and procedure for "compatibility" grouping and cites evidence of its validity.

WILLOUGHBY (New York University)
Contemporary Teaching of Secondary School Mathematics
CONTEMPORARY TEACHING OF SECONDARY SCHOOL MATHEMATICS is about the teaching of "modern mathematics." It includes a discussion of the good and not so good innovations that have occurred in the teaching of mathematics and helps the teacher to understand the mathematics and to use that understanding to do a better job of teaching. Each specific topic usually taught in secondary schools (from arithmetic to calculus, including probability, circular functions, linear programming, etc.) is discussed.

HAHN & SHAPIRO (both of the General Electric Company)
Statistical Models in Engineering
Provides a detailed discussion, directed principally at practicing engineers and scientists, of the use of statistical models to represent physical phenomena. Numerous models are considered and such important subjects as empirical distributions, error analysis, Monte Carlo simulation, probability plotting, and analytic tests for distributional assumptions are covered in unusual detail.

Geography

GOTTMANN (Ecole des Hautes Etudes, Sorbonne, Paris) &
HARPER (Southern Illinois University)
Metropolis on the Move
This is probably the only single-volume collection of essays—each written by a well known authority in his field—on this very pressing problem.

History

STIPP (Knox College)
DIRRIM (San Fernando Valley State College) &
HOLLISTER (University of California, Santa Barbara)
The Rise and Development of Western Civilization
Technical or professional terminology is avoided in this study of the beginnings, development and merging of the main currents of Western civilization from about 3000 B.C. to the present. The reader's attention is focused on pivotal decisions and developments, and the emphasis is on broad movements. Volume I carries the reader up to the mid-1600's; Volume II brings him up to modern times.

Languages

LENNEBERG (Harvard University)
Biological Foundations of Language
A new theory of the nature and function of language based on first hand observations on language development in healthy children and children with neurological disease. Includes discussions of anatomy, physiology, and evolution.

Materials Science

GUTMANN (University of New South Wales) &
LYONS (University of Queensland)
Organic Semiconductors
Nearly all books on semiconductors relate to INORGANIC materials. This book, confined to ORGANIC substances, attempts a broadly based review of all work done up to 1965. The more than 2000 references cited and the 54 tables of data should ensure its lasting value. It offers a full discussion of different theoretical and experimental methods of approach to the subject and also includes numerous suggestions for future developments and applications.

Mathematics

DUFFIN (Carnegie Tech.)
PETERSON & ZENER (both at Westinghouse Research Labs)
Geometric Programming: Theory and Application
This is the first introduction to geometric programming written for both the engineer and the applied mathematician. The authors present well organized material relating to the optimization of a representative class of problems. It will fulfill a need of the practical researchers and analysts in the area of control engineering.

KLINE (New York University)
Calculus: An Intuitive and Physical Approach
Treats the standard elementary calculus and analytic geometry from the standpoints of intuitive understanding and physical motivation and application.

Mechanics for Engineers

ERINGEN (Princeton University)
Mechanics of Continua
This is the first book presenting a unified approach to the mechanics, thermodynamics and constitutive theory of solids, fluids, and viscoelastic materials via the foundations of continuum mechanics. The basic concepts are thoroughly discussed and illustrated with the aid of significant examples and over 200 exercises.

Metallurgy

KOFSTAD (Oslo, Norway)
High-Temperature Oxidation of Metals (A volume in the Electrochemical Society Corrosion Monograph Series)
While it does not differ significantly from other books in the field, this book represents an up-to-date treatment of oxidation of metals in which progress has been very rapid. It includes a section on adsorption not given elsewhere. It treats the main principles of the many and often complex features of oxidation of metals rather than giving an exhaustive review of the very extensive literature which has accumulated over the years.

LOGAN (National Bureau of Standards, Washington, D.C.)
The Stress Corrosion of Metals (A volume in the Electrochemical Society Corrosion Monograph Series)
The first single-author work published in English that treats the stress corrosion of metals. The author presents a review of work in the field and includes pertinent work of his own. Stress corrosion cracking in the important alloy systems is discussed in detail together with theories of the mechanisms involved.

Books

Petroleum and Mining Engineering

HUGHES (Colorado School of Mines)
Oil Property Valuation
Primarily a textbook for undergraduate students in petroleum engineering and petroleum geology curriculums whose work includes courses dealing with the valuation of oil properties and related aspects of petroleum economics. The book will also serve as a refresher and self-study text for those who find themselves engaged in some of the many aspects of valuation work.

Photographic Science and Graphic Reproduction

WYSZECKI (National Research Council of Canada) &
STILES (The National Physical Laboratory, England)
Quantitative Data of Color Science
A unique collection of data on spectral energy distributions of light sources, transmissions of optical filters and other physical data, together with a concise exposition of color principles, formulae, and systems.

Physics

BEKEFI (Massachusetts Institute of Technology)
Radiation Processes in Plasmas (A publication in the Wiley Series in Plasma Physics)
This book deals with the emission, absorption and scattering of electromagnetic waves in gaseous plasmas. It is intended to complement existing books on plasma-wave interactions in which topics central to the present book have been omitted or given scant attention. This is the first serious effort to present the subject matter, previously in various journals, in a unified way and under one cover.

BROWN (Harvard University)
Introduction to Electrical Discharges in Gases (A publication in the Wiley Series in Plasma Physics)
This introduction to gas discharge physics surveys the areas of physics involved and illustrates the types of problems and techniques used in this branch of physics. The approach explains the physical behavior of the electrons and ions in the ionized state rather than introducing mathematical completeness of sophistication into the discussion.

MacDONALD (Lockheed Palo Alto Research Laboratory)
Microwave Breakdown in Gases (A publication in the Wiley Series in Plasma Physics)
The first unified treatment of both experimental and theoretical aspects, offering a self-contained and complete account of high-frequency and microwave electrical breakdown in gases. Includes detailed descriptions of the basic atomic processes involved in the phenomena and relates them to the theoretical analysis based on the Boltzmann equation.

SKELLAND (University of Notre Dame)
Non-Newtonian Flow and Heat Transfer
Deals with non-Newtonian systems in terms of quantitative relationships which are amenable to direct engineering application. Consideration is given to laminar, transitional and turbulent flow, optimization, boundary layer theory, mixing, and heat transfer. The treatment is sufficiently detailed to facilitate independent study, and comprehensive examples showing numerical computations are given throughout the book, together with many unworked problems for solution by the reader.

Police Science

ELDEFONSO (Foothill College)
Law Enforcement and the Youthful Offender
A textbook written specifically for Police Science Programs in Junior Colleges with classes in Juvenile Procedures, Crime Prevention, or Juvenile Delinquency. The extensive subject matter covers the major aspects of Police Work with Juveniles.

Political Science

DEUTSCH (Yale University)
Arms Control and the Atlantic Alliance
This book is based on the results of a major research effort on the acceptability of disarmament and arms control measures in the European political environment—now and over the next ten years.

Psychology

BALDWIN (New York University)
Theories of Child Development
Three distinctive features of the book are: (1) concentration on theories in developmental psychology; (2) review of six selected theories in depth, and (3) acceptance of many propositions from naïve psychology. The major theories of child development which are reviewed in depth include those of Sigmund Freud, Kurt Lewin, Jean Piaget, Heinz Werner, Talcott Parsons, and Robert F. Bales.

MOSS (National Institute of Mental Health [USPHS])
The Hypnotic Investigation of Dreams
This book represents a comprehensive, critical review of the employment of hypnotic techniques in the investigation of dream phenomena. It includes reprints of 12 outstanding clinical and experimental articles which have appeared in the professional journals in the past quarter century.

STEVENSON (Institute of Child Development, University of Minnesota)
HESS (The University of Chicago) &
RHEINGOLD (University of North Carolina)
Early Behavior: Comparative and Developmental Approach
The behavior of immature organisms is the central theme of the book. Each chapter presents the research findings of a competent and recognized investigator. The investigators were chosen to illustrate the many different approaches to the theme now current. As a consequence, a variety of species is studied, including man. This is the first attempt to bring together comparative and developmental psychologists who are doing research with different organisms and related problems.

Sociology

BORDUA (University of Illinois)
The Police: Six Sociological Essays
The essays consider today's conditions—professional, organizational, communal, legal—that affect the operation of the modern police department, including the recruitment and training of personnel.

NEWCOMB (The University of Michigan)
KOENIG (York University)
FLACKS (The University of Chicago) &
WARWICK (The University of Michigan)
Persistence and Change: A College and its Students After Twenty-Five Years
A restudy of women who, during their years as students at Bennington College in the 1930's, showed marked changes in their initially conservative attitudes toward public affairs. Most of these women still retain, today, their essentially liberal points of view. Changes in the college itself, after twenty-five years, are also reported.

SMELSER (University of California, Berkeley)
Sociology: An Introduction
A high-level introduction to sociology that presents a selective and in-depth account of the field. Twelve outstanding scholars have prepared the material. Emphasis is on systematic theory and research, social change, and comparative studies.

Interscience Publications

Biology

KAESTNER (University of Munich)
Invertebrate Zoology: Volume I
An advanced up-to-date volume with emphasis on embryology and diversity of animals. This comparative approach shows diversity within groups rather than representing groups by one "typical" animal.

Chemistry

ETTRE (Perkin-Elmer Corp.)
ZLATKIS (University of Houston)
Practice of Gas Chromatography
A practical tool for workers involved in the day by day operations of gas chromatography. Topics include: Basic Knowledge of Gas Chromatography and Gas Chromatographic Instruments; The Mobile Phase; Derivatives and Sampling; Columns in Gas Chromatography; Detectors; Applications of Digital Electronic Systems to Gas Chromatography; The Interpretation of Analytical Results—Qualitative and Quantitative Analysis; Ancillary Systems; Reaction Gas Chromatography; Automatic Process Gas Chromatography.

LENZ (University of Massachusetts)
Organic Chemistry of Synthetic High Polymers
A detailed treatment of the mechanism and stereochemistry of all important organic polymerization reactions. Emphasis is placed on reaction mechanisms and on problems encountered in achieving high molecular weights for each major type of organic polymerization reaction.

OLAH (Case-Western Reserve University)
SHLEYER (Princeton University)
Carbonium Ions
(Reactive Intermediates Series)
Well-known authorities deal with one of the most important topics in organic chemistry in this collective volume. Topics include: Thermodynamic Aspects; Cryoscopy and Conductivity in Acids; Conductivity in Aprotic Solvents; Electronic Spectra; Vibrational Spectra; Nuclear Magnetic Resonance Spectra; Mass Spectra; Iotopic Tracers; Carbonium Ions on Solid Surfaces; Transient (Hot) Carbonium Ions; and Intramolecular Hydride Shifts.

WENDER (U.S. Department of the Interior, Bureau of Mines) &
PINO (Istituto di Chimica Organica Industriale, l'Università di Pisa)
Organic Syntheses Via Metal Carbonyls
The first volume of a highly important treatise, to be published in three parts. Volume 1 covers general topics, including a comprehensive treatment of metal carbonyls, their preparation, structure, and properties; Volume 2 will deal with the inorganic aspects of the subject; and Part 3 will cover the organic aspects.

Metallurgy

BUNSHAH (University of California, Livermore)
Techniques of Metals Research
A new series of books covering the techniques in metals materials systems and solid state systems. Volume I: Technology of Materials Preparation and Handling. Volume II: Techniques for the Direct Observation of Structure and Imperfections.

Physics

MARSHAK (University of Rochester)
Perspectives in Modern Physics
Dedicated to Hans A. Bethe on the occasion of his 60th birthday by his pupils and friends, this volume reflects the broad and versatile contributions Dr. Bethe has made to almost every branch of physics.